APPENDIX B

RESPONSIVENESS SUMMARY

B Responsiveness Summary

B.1 Purpose

As stated in the U. S. Environmental Protection Agency (EPA) Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, the responsiveness summary serves three important purposes. First it provides the DOE with information about community preferences regarding both the proposed remedial alternative and general concerns about the site. Second, it demonstrates how public and support agency comments were integrated into the decision-making process. Third, it allows DOE to formally respond to public comments.

This Responsiveness Summary has been prepared to meet the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA). As the lead agency at the FCP, DOE is required to respond "…to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on the Revised Proposed Plan for Remedial Action at Silo3.

B.2 Community Participation For Silo 3

DOE is responsible for conducting the community relations for the FCP. A community relations program was established for the FEMP in 1985 to provide information about the site regarding updates and progress of the clean-up activities.

In November 1993, DOE implemented a public participation program at Fernald to involve community members and other interested parties in the decision-making process at the site. This Fernald Community Advisory Board (FCAB), formerly known as the Fernald Citizens Task Force, was chartered to provide DOE, EPA, and Ohio Environmental Protection Agency (OEPA) with recommendations about cleanup solutions and future courses of action at the FEMP. These efforts, along with the community relations activities required by CERCLA, reflect DOE's intent to fully involve the community in the decision-making process.

More recently, DOE has encouraged public involvement and informal comment throughout reevaluation of the remedy for Silo 3. Stakeholder input was a key factor in development of the revised remedy formally recommended in the PP issued for formal review. This approach has provided a genuine opportunity for stakeholders to identify issues, voice their concerns, and learn about the proposed clean-up plan. The informal opportunity for the public to provide input enabled DOE to address stakeholder questions and concerns in advance of the formal public comment period.

Two Administrative Records, located at the Public Environmental Information Center at the FCP and EPA Region V offices in Chicago, Illinois have been established to provide an information repository on the decision-making process for interested members of the public.

B.2.1 Public Comment Period

The DOE recently held a public comment period from April 30 through May 30, 2003, for interested parties to comment on the modified selected remedy for the Silo 3 material. The public comment period was held in accordance with Section 117 of CERCLA. A public hearing was held in the vicinity of the FCP on May 13, 2003 to provide the public with a forum to submit oral comments on the proposed revised remedy. No written or oral comments were received by DOE at the Public Hearing. A transcript of the hearing is included in the attachment to this Responsiveness Summary.

The availability of the Final PP and supporting documentation, the schedule for the comment period, and the location and schedule for the public hearing, were announced in local newspapers on April 30, 2003. In addition, this information was announced on the Fernald Closure Project web site (www.fernald.gov), and communicated by direct mail to stakeholders on the FCP Public Affairs mailing list.

B.2.1.1 Responses to Public Comments

Comments were received from only one stakeholder during the public comment period. These comments, and DOE's response to each comment, are documented below.

<u>Comment 1: from Robert Vogel</u>

"As the initial justification for the use of soft sided shipping containers for Silo 3 material was that it would be in a treated form and therefore resistant to dispersion, the Proposed Plan should explain why untreated Silo 3 material will not disperse. On page 3-6 the airborne release fraction of 0.01 is referenced as the "bounding value" without any attempt to connect this number to the specific characteristics of Silo 3 material. Due to the two different materials which Silo 3 contains (refer to M:SP:2001-0082) the number 0.01 can only be correct to use for one of these materials. Anyone familiar with Silo 3 material of rotary calciner origin would find it difficult to believe that 0.01 is reflective of this extremely dispersible material. It is probably reasonable to use this number for material produced by the spray calciner, but it is clearly inappropriate to use this number for both materials."

Response: The primary issue raised in this comment is whether or not the airborne release fraction (ARF) utilized in the transportation risk evaluation adequately represents the behavior of the material, given the known variability in the sources and physical characteristics of the material. The ARF is one of three interdependent parameters affecting potential inhalation exposure, and represents the fraction of any material released from a container that becomes airborne. The other two are the Fraction Released (fraction of material in a container that is released during an accident) and the Respirable Fraction (fraction of the airborne material that becomes respirable). The fraction released is scaled to the various accident severity categories with 100 percent assumed for the most severe accident. For the Silo 3 transportation risk evaluation, the Respirable Fraction was assumed to be 36 percent based on the most conservative empirical data from tests on Silo 3 material.

A significant literature search was conducted prior to the conducting the RADTRAN modeling runs for the risk evaluation in order to derive a best and supportable ARF. The American Society of Mechanical Engineers performed an independent peer review of the DOE reference guide on ARFs (DOE-HDBK-3010*, Airborne Release Fraction/Rates And Respirable Fractions for Nonreactor Nuclear Facilities*. The ASME recommended a bounding ARF of 0.01 for powders. ASME deemed this to be conservative value and this ARF was adopted for use in the RADTRAN modeling runs performed for the Silo 3 risk analysis. The earlier RADTRAN runs referenced in the comment used an ARF of 0.0001 based upon the DOE reference guide (DOE-HDBK-3010). The current ARFs used for the risk analyses supporting the Silo 3 Proposed Plan are more conservative by a factor of 100.

As discussed in the Proposed Plan, the treatment step included as part of the revised remedy will result in a substantial reduction in ARF compared to the untreated material, However, in order to provide additional conservatism, the transportation risk evaluation took no credit for the any reduction in dispersability resulting from the treatment step.

It is recognized, as stated in this comment, the materials within Silo 3 are not homogeneous and likely have a span of ARFs because of the large range of particle sizes. It is recognized that variability in the physical characteristics of Silo 3 material will impact its dispersability and ARF. However, based upon both the conservatism incorporated into the RADTRAN modeling assumptions and independent evaluation of the ARF basis, the ARF of 0.01 is sufficiently conservative to represent the range of characteristics present in Silo 3 material, including material produced by the rotary calciner. Therefore, the evaluation documented in the Proposed Plan adequately characterizes the transportation risk associated with the proposed remedy.

Comment 2: from Robert Vogel

"Page 3-17, 2nd paragraph, second sentence – "inhalation" is stated to be calculated but there are no data to quantify inhalation so that the reviewer cannot determine if the amount assumed to be inhaled is reasonable. If the purpose of this document is to be informative to the public, it should focus on the elements of this project that are most important; no aspect should be made more clear to the reader than that of inhalation since "cloudshine" and "groundshine" are trivial in comparison. The Proposed Plan does not clarify this issue. This is especially questionable given the inappropriate use of the release fraction mentioned above.

Secondly, the amount of material assumed to be inhaled would be helpful to know as the ILCR data stated in the Proposed Plan is not significantly different from RADTRAN data generated in 2002 which was solely based on external dose. As the external dose potential for Silo 3 is minor compared to potential internal exposure, the inclusion of inhalation dose should be reflected in the ILCR data. To be believable, inhalation data should be quantified in the Proposed Plan."

Response: This comment raises two primary issues: 1) Are the assumptions made in the risk evaluation regarding the amount of silo 3 material assumed to be inhaled in an accident scenario reasonable; and 2) to what extent is the resulting inhalation dose considered in calculating the dose and resulting Incremental Lifetime Cancer Risk (ILCR).

The radiological risks to the public and workers during transportation of Silo 3 material were evaluated using the RADTRAN5 computer model and code developed by Sandia National Laboratories. The dose conversion factors and other input parameters used in the evaluation of Silo 3 material are documented in Tables 2 through 5 in the Transportation Risk Evaluation (Attachment 3 in the Technical Supplement to the Silo 3 Proposed Plan). The final section of the Transportation Risk Evaluation also provides references to the documents providing the methodology and technical basis for the risk evaluation.

In response to the first issue raised in the comment, the amount of airborne material assumed to be inhaled (the Respirable Fraction (RF)) utilized in the risk evaluation was a conservative estimate based upon available data on Silo 3 material. It is generally accepted that respirable particles are those less than 10 µm in diameter. The most conservative and supportable test results for Silo 3 material yielded an average fraction of 36 percent of the material that was less than 10 µm in diameter. Other tests suggested as low as 0.99 percent of the particles were less than 10 µm. The current RADTRAN runs assumed 36 percent of the airborne material was respirable.

Second, the population dose and risk for routine (non-accident) transport is based solely on external radiation dose. For the accident scenarios the external and internal doses are summed. The doses are reported as the sum of inhalation, ground shine, and cloud shine. Since, as recognized in the comment, dose from “cloudshine” and “groundshine” is trivial (approximately 1%) in comparison to dose from inhalation, the reported accident scenario doses and resulting ILCR attribute 99% of the dose to inhalation following an accident..

An important factor in calculating the inhalation dose is the Dose Conversion Factor (DCF) or the dose per quantity of activity inhaled. In preparation for the current RADTRAN runs, the characteristics of the Silo 3 radionuclide forms were evaluated to assure use of the most appropriate solubility class DCF assignment. Processing of the Silo 3 material with the rotary calciner was more likely to have produced insoluble material (termed Class Y material), which in most cased results in DCFs which are considerably higher than more soluble material and deliver more dose per unit activity inhaled. Sometimes this dose is one to two orders of magnitude higher. The less effective spray calciner would have tended to produce insoluble material, but may also have produced some materials with higher solubility (lower DCF) than those yielded from the rotary calciner. The modeling conducted to support the Silo 3 risk evaluation conservatively assumed an insoluble form for the Silo 3 materials and utilized the higher DCF’s (Class Y) for dose calculation purposes.

One exception to the above discussion should be noted, that being for Thorium-230, one of the predominant radiological constituents present in the Silo 3 materials. Thorium-230 has a soluble DCF that is 24 percent higher than its insoluble form. Although thorium compounds, including those associated with Silo 3 material, are considered to be insoluble, the DCF used in the Silo 3 risk analysis was the average between the soluble and insoluble forms as a conservative bounding value.

Following estimation of dose for a given routine or accident based transportation scenario, the RADTRAN model is then used to yield an estimate of the risk to an exposed individual or population. The model estimates risk by multiplying the calculated dose by a single fatal cancer risk coefficient of 5 $\times 10^{-4}$ per rem. This includes both internal and external radiation dose equivalents. This risk coefficient is utilized in the Silo 3 risk evaluation and is consistent with the recommendations and methods in *Health Effects of Exposure to Low Levels of Ionizing Radiation,* BEIR V, National Academy of Sciences (1990) and ICRP 60, *Recommendations of the International Commission on Radiological Protection,* International Commission of Radiological Protection (1991). The resultant risk totals were quite low and no other specific organ dose assessment was necessary.

The information summarized above demonstrates that the assumptions underlying the risk evaluation are reasonable given the known variations in the physical properties of the Silo 3 residues and provide an appropriate basis for decision making.

<u>Comment 3: from Robert Vogel</u>

"Much of the data used in the development of the current plan derives from testing done by Jenike and Johanson on Silo 3 material. Unfortunately, this material was from Small Scale Retrieval origin with its extremely different characteristics from the remaining two thirds of the silo material. For the expertise of Jenike and Johanson to fully benefit the project and provide the basis for design decisions, they should have been provided with Silo 3 material of rotary calciner origin."

Response: The primary concern raised in this comment is the degree to which the testing done by Jenike & Johanson (J&J) was based upon sufficiently representative characterization of the physical properties of Silo 3 material. Due to their expertise in the field of bulk solids storage, transfer, and flow, J&J was utilized to perform physical property studies to support evaluation of retrieval, material handling, and treatment alternatives for Silo 3 material. As noted in the comment, these studies were performed utilizing actual Silo 3 material as well as flyash which has similar dusting properties. The Silo 3 material used in these studies was, as indicated in the comment, from the Small-Scale Waste Retrieval Project, obtained in the lower portion of the silo, where it would be expected to be of spray calciner origin.

In addition to their evaluation of the actual Silo 3 material, J&J also utilized a significant body of historical data on the characteristics of Silo 3 material, which included copies of historical silo 3 information (reference M:SP:2001-0082) and videos of the vibracore sampling that was performed from the top of the silo. Design decisions were also based on information from past processing facilities, sampling results from several sampling efforts, studies from multiple consultants, and objectives for final disposal.

Physical tests performed by Jenike and Johanson were performed at different moisture levels to determine the affect on flowability due to hygroscopic nature of the material, and modeling was done for different scenarios to allow for variability in material properties.

Jenike and Johanson studies provided design information consistent with dry, fine powdery material as opposed to free-flowing material such as plastic pellets or coarse sand. The report validates material handling observations made during the various sampling and testing efforts performed on Silo 3, and the original pneumatic conveyance approach used to transfer the material from the old production area to the storage silo. The various reports support the current proposed design approach, which uses: batch process with limited overnight storage in bins; steep sided bins for mass flow; screw conveyors; densification table added to packaging system to de-aerate material after it becomes fluidized; and weigh table for package filling due to density differences and also because packaging will be volume not weight limited; and spray nozzle assembly. Modeling also provides various scenarios for pneumatic retrieval and mechanical retrieval, both methods selected due to anticipated variation in compaction of material.

The combination of physical testing of actual Silo 3 material, utilization of a variety of modeling scenario to account for variability in material characteristics, and the use of historical data to support and supplement the studies, provides a sound technical basis for the evaluation of retrieval, material handling, and treatment alternatives for Silo 3 material.

ATTACHMENT B-1

TRANSCRIPT OF MAY 13, 2003 PUBLIC HEARING